

POSITIONS AND AREAS OF SUN SPOTS—Continued

Date	Eastern stand- ard time	Heliographic			Area		Total area for each day	Observatory
		Diff. in longi- tude	Longi- tude	Lati- tude	Spot	Group		
	<i>h m</i>	<i>°</i>	<i>°</i>	<i>°</i>				
Mar. 13.....	10 57	-22.0	274.7	+2.0	-----	170	-----	U. S. Naval.
		-17.0	279.7	-17.0	-----	93	-----	
		+51.0	347.7	-27.5	-----	15	-----	
		+67.0	363.7	+25.0	-----	15	293	
Mar. 14.....	11 23	-70.0	213.3	+23.0	39	-----	-----	Do.
		-8.0	275.3	+1.5	-----	139	-----	
		-4.0	279.3	-16.5	-----	108	-----	
		+65.0	348.3	-27.0	-----	77	363	
Mar. 15.....	11 6	-56.0	214.3	+22.5	62	-----	-----	Do.
		+4.5	274.8	+1.5	-----	93	-----	
		+9.0	279.3	-16.5	-----	77	232	
Mar. 16.....	11 27	-40.0	216.9	+22.5	-----	77	-----	Do.
		+4.0	260.9	+30.0	-----	93	-----	
		+18.5	275.4	+1.0	-----	62	-----	
		+20.0	276.9	-15.5	-----	62	294	
Mar. 18.....	11 24	-12.0	218.6	+22.5	-----	23	-----	Do.
		+30.0	260.6	+30.0	-----	108	-----	
		+48.0	278.6	+1.0	54	-----	185	
Mar. 20.....	11 7	-68.0	136.4	-21.5	-----	39	-----	Do.
		+56.5	260.9	+31.0	-----	93	132	
Mar. 21.....	13 15	-54.0	136.0	-21.0	-----	62	-----	Do.
		+70.0	260.0	+31.0	-----	100	162	
Mar. 22.....	13 48	-39.0	137.5	-22.0	-----	54	54	Do.
Mar. 23.....	10 45	-27.0	137.9	-22.0	-----	32	32	Mt. Wilson.
Mar. 24.....	13 30	-17.0	133.3	-22.0	-----	7	7	Do.
Mar. 25.....	11 5	-31.0	107.4	-34.0	-----	9	9	Do.
Mar. 26.....	10 22	No spots			-----			U. S. Naval.
Mar. 27.....	11 39	No spots			-----			Do.
Mar. 28.....	10 45	No spots			-----			Mt. Wilson.
Mar. 29.....	11 20	No spots			-----			U. S. Naval.
Mar. 30.....	11 7	No spots			-----			Do.
Mar. 31.....	9 15	No spots			-----			Mt. Wilson.
Mean daily area for 29 days.....							118	

PROVISIONAL SUN-SPOT RELATIVE NUMBERS, MARCH 1935

(Dependent alone on observations at Zurich and its station at Arosa)

[Data furnished through the courtesy of Prof. W. Brunner, Eidgen. Sternwarte, Zurich, Switzerland]

March 1935	Relative numbers	March 1935	Relative numbers	March 1935	Relative numbers
1.....	19	11.....	Wc 34	21.....	25
2.....		12.....	44	22.....	17
3.....	a 20	13.....	56	23.....	12
4.....		14.....	da 72	24.....	8
5.....	17	15.....	aa 68	25.....	8
6.....	15	16.....	Mc 50	26.....	8
7.....	8	17.....	43	27.....	7
8.....	8	18.....	33	28.....	0
9.....	d 17	19.....	Ec 40	29.....	
10.....	Ec 27	20.....	35	30.....	0
				31.....	

Mean, 27 days = 25.6

a = Passage of an average-sized group through the central meridian.
 c = New formation of a center of activity: *E*, on the eastern part of the sun's disk; *W*, on the western part; *M*, in the central zone.
 d = Entrance of a large or average-sized center of activity on the east limb.

AEROLOGICAL OBSERVATIONS

[Aerological Division, D. M. LITTLE, in Charge]

By L. T. SAMUELS

Free-air temperatures during March averaged below normal at the western stations and above normal elsewhere, at stations where a sufficient period of previous record made it possible to determine departures. (See table 1.) The magnitudes of the departures ranged from moderate to large in most cases. The lowest average temperatures for the month occurred at the highest levels over the extreme Northwest. Free-air relative humidity departures were small in most cases, the largest being negative and occurring over San Diego.

The directions of the resultant winds for the month at 1,000 meters above sea level were close to the normal over the Pacific coast stations, but were more southerly than normal over the Plains States and southward from the Great Lakes. (See table 2.) A greater northerly component than normal occurred over Sault Ste. Marie and Boston. The velocities of the resultant winds at this level were mostly in excess of the normal, with

greatest departures over Oklahoma City, Murfreesboro, and Key West.

At 3,000 meters the directions of the resultant winds were westerly as compared to the normal west-north-westerly, over the central and north-central sections. At Key West they were easterly as compared to the normal westerly. The velocities were generally above normal over the more northern sections and below normal over the southern sections.

At 5,000 meters there was an excess of northerly components as compared to the normal over the middle Pacific coast region, and an excess of southerly components over the more eastern Rocky Mountain stations. The velocities exceeded the normal resultants over the western Plateau, the lower Plains States, and the north-eastern section of the country, with the largest departures over the extreme northern stations.

TABLE 1.—Mean free-air temperatures and relative humidities obtained by airplanes during March 1935

TEMPERATURE (°C.)																			
Stations	Altitude (meters) m. s. l.																Number of observations		
	Surface		500		1,000		1,500		2,000		2,500		3,000		4,000			5,000	
	Mean	Departure from normal	Mean	Departure from normal	Mean	Departure from normal	Mean	Departure from normal	Mean	Departure from normal	Mean	Departure from normal	Mean	Departure from normal	Mean	Departure from normal		Mean	Departure from normal
Billings, Mont. ¹ (1,088 m)	-3.0						-0.8		-2.8		-6.3		-9.8		-16.4		-23.2	28	
Boston, Mass. ¹ (6 m)	1.0	0.0	0.0	+2.0	-0.9	+2.9	-2.0	+2.9	-3.5	+2.8	-5.7	+2.5	-8.0	+2.1	-13.7	+1.5	-19.2	+1.6	18
Cheyenne, Wyo. ¹ (1,873 m)	-2.2								-1.5		-2.4		-5.1		-11.5		-18.3	30	
Fargo, N. Dak. ¹ (274 m)	-4.2		-4.0		-4.2		-5.0		-6.2		-8.4		-11.2		-17.4		-24.6	31	
Kelly Field (San Antonio), Tex. ¹ (206m)	14.9		16.0		15.7		14.7		12.9		11.4		8.4		1.3		-6.1		29
Lakehurst, N. J. ¹ (3 m)	3.9		4.3		3.1		1.8		0.0		-2.5		-4.9		-11.1		-16.7	18	
Maxwell Field (Montgomery), Ala. ¹ (52 m)	13.1		14.2		13.2		11.3		9.2		6.4		3.7		-2.8		-8.9		27
Mitchel Field (Hempstead, L. I.), N. Y. ¹ (29 m)	3.0		4.4		3.1		1.6		0.0		-2.3		-4.5		-9.9		-15.9		30
Murfreesboro, Tenn. ¹ (174 m)	10.5		11.0		9.9		8.6		6.4		4.3		1.2		-5.3		-11.7		31
Norfolk, Va. ¹ (10 m)	9.4	+2.4	9.4	+3.1	8.1	+3.7	6.0	+3.8	4.3	+4.2	2.8	+4.7	0.8	+4.9	-4.8	+4.8	-10.8	+4.8	27
Oklahoma City, Okla. ¹ (391 m)	10.3		10.9		12.3		10.8		8.4		5.2		1.9		-5.5		-12.5		30
Omaha, Nebr. ¹ (300 m)	2.6	+3.2	3.7	+3.7	5.1	+4.6	4.2	+4.3	2.1	+3.6	-1.0	+2.9	-4.3	+2.4	-11.0	+2.0	-17.9	+1.9	31
Pearl Harbor, Territory of Hawaii ¹ (6 m)	19.2	-4.0	19.0	-1.2	15.9	-0.5	12.8	-0.8	10.9	-0.3	8.5	-0.8	5.8	-1.6	0.0	-2.8	-3.2	-2.8	28
Pensacola, Fla. ¹ (24 m)	14.5	+2.6	15.3	+4.1	14.0	+4.6	12.2	+4.6	10.1	+4.4	8.9	+5.2	7.1	+5.5	2.3	+6.4	-4.1	+6.5	14
San Diego, Calif. ¹ (10 m)	9.6	-4.7	9.3	-3.7	7.5	-4.7	6.1	-4.0	4.3	-3.6	2.5	-2.8	-0.1	-2.6	-5.8	-1.6	-13.3	-1.6	31
Scott Field (Belleville), Ill. ¹ (135 m)	7.3		9.0		9.4		7.4		5.5		2.5		0.0		-6.4		-12.7		25
Seattle, Wash. ¹ (25 m)	4.5	-4.7	2.7	-3.7	-0.4	-3.8	-3.8	-4.3	-7.3	-4.8	-10.6	-5.2	-13.6	-5.5	-20.0	-6.0	-27.3	-7.1	20
Selfridge Field (Mount Clemens), Mich. ¹ (177 m)	0.2		1.2		1.5		0.3		-1.8		-3.7		-6.3		-12.1		-18.7		29
Spokane, Wash. ¹ (596 m)	1.8				0.1		-2.5		-6.3		-9.4		-12.7		-19.3		-26.2		30
Sunnyvale, Calif. ¹ (10 m)	8.0	-4.1	7.1	-2.7	5.2	-3.2	2.8	-3.8	0.9	-3.5	-2.1	-3.6	-4.9	-3.6	-10.6	-3.1	-16.6	-3.1	24
Washington, D. C. ¹ (13 m)	6.9	+1.6	7.4	+3.6	6.0	+4.0	4.4	+4.5	3.1	+5.2	0.8	+4.9	-1.5	+4.6	-7.2	+4.6	-13.4	+4.6	25
Wright Field (Dayton), Ohio ¹ (244 m)	5.9		5.7		5.9		4.2		2.5		0.3		-2.3		-8.4		-15.2		26
RELATIVE HUMIDITY (PERCENT)																			
Billings, Mont.	69						60		57		61		63		59		52		
Boston, Mass.	69	+1	65	-3	60	-5	56	-5	53	-6	51	-7	50	-5	47	-5	46	-4	
Cheyenne, Wyo.	54								54		51		50		49		46		
Fargo, N. Dak.	79		77		69		62		58		55		52		49		46		
Kelly Field (San Antonio), Tex.	84		77		69		61		54		39		34		30		30		
Lakehurst, N. J.	78		67		58		58		54		52		48		45		40		
Maxwell Field (Montgomery), Ala.	81		69		61		52		48		44		42		39		39		
Mitchel Field (Hempstead, L. I.), N. Y.	79		70		66		64		60		58		56		55		52		
Murfreesboro, Tenn.	81		72		69		63		60		52		51		45		48		
Norfolk, Va.	72	+5	67	+6	63	+5	62	+6	57	+4	51	+2	45	0	40	0	37	0	
Oklahoma City, Okla.	76		73		57		48		42		39		37		38		38		
Omaha, Nebr.	76	-2	70	-3	57	-5	49	-6	46	-6	46	-6	49	-4	54	0	55	+1	
Pearl Harbor, Territory of Hawaii.	83	+14	78	+4	77	0	74	+2	63	-2	56	+1	45	+2	38	+11	37	+10	
Pensacola, Fla.	88	+12	73	+6	67	+6	63	+6	60	+7	54	+4	49	+2	39	-2	34	-5	
San Diego, Calif.	85	-14	79	-11	71	-16	59	-13	49	-11	42	-8	39	-8	36	-8	39	-8	
Scott Field (Belleville), Ill.	80		66		55		52		48		46		46		43		47		
Seattle, Wash.	80	+10	79	+9	77	+9	74	+8	73	+9	69	+10	64	+10	60	+9	60	+10	
Selfridge Field (Mount Clemens), Mich.	82		72		62		57		50		42		44		40		38		
Spokane, Wash.	72				71		68		67		67		67		63		62		
Sunnyvale, Calif.	83	+8	70	-1	65	+2	61	+7	58	+8	52	+7	47	+5	42	+4	40	+4	
Washington, D. C.	70	+3	64	0	63	+1	64	+4	61	+3	56	+2	51	+1	47	0	44	0	
Wright Field (Dayton), Ohio.	73		71		61		61		52		47		41		36		37		

RELATIVE HUMIDITY (PERCENT)

Billings, Mont.	69				60		57		61		63		59		52	
Boston, Mass.	69	+1	65	-3	60	-5	56	-5	51	-7	50	-5	47	-5	46	-4
Cheyenne, Wyo.	54						54		52		50		49		47	
Fargo, N. Dak.	79		77		69		62		55		50		49		46	
Kelly Field (San Antonio), Tex.	84		77		69		61		54		39		34		30	
Lakehurst, N. J.	78		67		58		58		54		52		48		45	
Maxwell Field (Montgomery), Ala.	81		69		61		52		48		44		42		39	
Mitchel Field (Hempstead, L. I.), N. Y.	79		70		66		64		60		58		56		52	
Murfreesboro, Tenn.	81		72		69		63		60		52		51		48	
Norfolk, Va.	72	+5	67	+6	63	+5	62	+6	57	+4	51	+2	45	0	40	0
Oklahoma City, Okla.	76		73		57		48		42		39		37		38	
Omaha, Nebr.	76	-2	70	-3	57	-5	49	-6	46	-6	46	-6	49	-4	54	0
Pearl Harbor, Territory of Hawaii	83	+14	78	+4	77	0	74	+2	63	-2	56	+1	45	+2	38	+11
Pensacola, Fla.	88	+12	73	+6	67	+6	63	+6	60	+7	54	+4	49	+2	39	-2
San Diego, Calif.	85	-14	79	-11	71	-16	59	-13	49	-11	42	-8	39	-8	36	-8
Scott Field (Belleville), Ill.	80		66		55		52		48		46		43		40	
Seattle, Wash.	80	+10	79	+9	77	+9	74	+8	73	+9	69	+10	64	+10	60	+9
Selfridge Field (Mount Clemens), Mich.	82		72		62		57		50		42		44		38	
Spokane, Wash.	72				61		68		67		67		67		63	
Sunnyvale, Calif.	83	+8	70	-1	65	+2	61	+7	56	+8	52	+7	47	+5	42	+4
Washington, D. C.	70	+3	64	0	63	+1	64	+4	61	+3	56	+2	51	+1	47	0
Wright Field (Dayton), Ohio	73		71		61		61		62		47		41		36	

¹ Weather Bureau.² Massachusetts Institute of Technology.³ Army.⁴ Navy.⁵ National Guard.

Observations taken about 5 a. m., 75th meridian time, except along the Pacific coast and Hawaii where they are taken at dawn.

NOTE.—The departures are based on "normals" covering the following total number of observations: Boston, 70; Pearl Harbor, 101; Pensacola, 125; Sunnyvale, 52; Omaha, 123; Washington, 187; Norfolk, 129; San Diego, 152; Seattle, 52.

TABLE 2.—Free-air resultant winds (meters per second) based on pilot-balloon observations made near 6 a. m. (E. S. T.) during March 1935

[Wind from N=360°, E=90°, etc.]

Altitude (m) m. s. l.	Albuquerque, N. Mex. (1,554 m)		Atlanta, Ga. (309 m)		Billings, Mont. (1,088 m)		Boston, Mass. (15 m)		Cheyenne, Wyo. (1,873 m)		Chicago, Ill. (192 m)		Cincinnati, Ohio (153 m)		Detroit, Mich. (204 m)		Fargo, N. Dak. (274 m)		Houston, Tex. (21 m)		Key West, Fla. (11 m)		Medford, Oreg. (410 m)		Murfreesboro, Tenn. (180 m)	
	Direction	Velocity	Direction	Velocity	Direction	Velocity	Direction	Velocity	Direction	Velocity	Direction	Velocity	Direction	Velocity	Direction	Velocity	Direction	Velocity	Direction	Velocity	Direction	Velocity	Direction	Velocity	Direction	Velocity
Surface	337	1.3	241	1.1	265	2.4	296	2.7	271	4.8	176	0.3	283	0.9	268	1.4	231	1.5	111	1.2	97	3.1	202	0.3	198	2.2
500			253	3.1			302	7.2			231	5.2	230	4.1	276	2.9	233	3.3	174	5.3	108	6.8	212	0.6	222	7.2
1,000			258	6.1			268	9.4			251	8.2	267	7.4	288	5.2	258	5.2	218	5.5	121	6.0	238	1.7	246	11.5
1,500					287	8.3			300	12.3			264	6.4	283	5.9	282	7.3	220	7.1	128	4.1	236	3.2	257	10.8
2,000	276	3.9	273	8.4	269	9.7	297	12.3	271	6.7	273	10.3	263	5.4	282	5.9	274	9.0	236	7.0	133	3.8	249	4.4	266	9.3
2,500	273	6.3	287	8.5	274	10.1	289	13.1	272	13.3	286	10.3	271	8.7	281	10.1	275	11.0	239	7.0	121	2.9	269	5.4	268	10.6
3,000	268	7.3	271	9.8	274	11.2	288	14.5	276	13.8	287	10.3	279	6.3	278	11.5	292	11.6	262	7.2	98	2.8	286	6.2	255	10.3
4,000	267	12.4	281	11.6	268	14.3	299	24.6	267	16.0	285	11.8			288	15.3	254	10.3	255	7.1	54	2.7	305	10.7	270	8.0
5,000	255	14.1			246	10.2	292	25.0	248	11.0					282	11.8	270	12.0	279	9.9	14	3.4	316	13.4		

TABLE 2.—Free-air resultant winds (meters per second) based on pilot-balloon observations made near 6 a. m. (E. S. T.) during March 1935—Continued

[Wind from N=360°, E=90°, etc.]

Altitude (m) m. s. l.	Newark, N. J. (14 m)		Oakland, Calif. (8 m)		Oklahoma City, Okla. (402 m)		Omaha, Nebr. (306 m)		Pearl Harbor, Terri- tory of Hawaii ¹ (68 m)		Pensacola, Fla. ¹ (24 m)		St. Louis, Mo. (170 m)		Salt Lake City, Utah (1,294 m)		San Diego, Calif. (15 m)		Sault Ste. Marie, Mich. (198 m)		Seattle, Wash. (14 m)		Spokane, Wash. (603 m)		Washing- ton, D. C. (10 m)	
	Direction	Velocity	Direction	Velocity	Direction	Velocity	Direction	Velocity	Direction	Velocity	Direction	Velocity	Direction	Velocity	Direction	Velocity	Direction	Velocity	Direction	Velocity	Direction	Velocity	Direction	Velocity	Direction	Velocity
Surface.....	320	1.2	156	0.7	178	2.9	134	1.0	34	1.4	81	1.4	197	1.5	163	3.6	15	0.4	330	0.2	178	3.3	167	0.9	194	0.9
500.....	292	4.4	281	2.4	198	6.6	193	1.3	67	2.4	189	3.2	215	4.5	280	1.7	360	0.9	202	6.0	202	6.0	231	6.2	231	6.2
1,000.....	293	8.6	305	3.3	235	11.5	256	4.7	86	0.8	206	4.1	253	8.6	289	2.7	286	2.6	195	4.8	226	4.4	256	7.6	256	7.6
1,500.....	285	11.7	296	4.0	245	11.3	268	6.8	216	2.3	231	4.3	261	8.3	174	5.0	282	2.8	303	4.1	221	3.8	235	6.1	267	10.2
2,000.....	280	15.0	297	4.8	256	11.3	276	8.6	230	3.4	242	4.3	262	10.0	199	5.3	262	3.3	289	7.0	259	2.6	244	6.9	298	11.5
2,500.....	282	13.0	304	5.5	263	12.1	271	9.8	261	3.6	227	3.7	279	9.4	235	4.9	464	4.1	287	8.6	297	3.3	249	6.2	297	11.1
3,000.....	299	11.2	321	6.2	274	9.3	261	10.9	242	3.6	261	3.6	298	12.1	264	6.3	275	4.0	277	9.5	299	4.3	270	7.6	295	12.3
4,000.....	-----	-----	323	10.4	312	11.9	234	15.4	207	6.3	242	5.1	274	12.8	273	10.1	275	5.8	290	14.5	306	8.7	298	7.4	323	16.3
5,000.....	-----	-----	318	5.8	298	11.0	-----	-----	-----	-----	-----	-----	-----	-----	290	10.5	64	2.3	270	25.0	-----	-----	302	13.2	-----	-----

¹ Navy stations.

RIVERS AND FLOODS

[River and Flood Division, MONTROSE W. HAYES, in charge]

By RICHMOND T. ZOCH

There were numerous overflows in the rivers of the eastern half of the United States during March 1935. Fortunately, most of these overflows were of minor consequence.

The Tombigbee and Black Warrior Rivers reached high stages; but relatively little damage resulted, since little planting had been done.

In the Pearl and Pascagoula River systems severe floods occurred. Heavy rains fell over these watersheds from the 4th to the 7th, and light to moderate rains continued through the 12th. These rains caused flood stages at every gage station on these rivers, with severe flood conditions in the Pearl River above Columbia, Miss., and in the Chickasawhay and Leaf Rivers. Jackson, Miss., suffered more than any other locality in these watersheds; at Jackson the water reached a stage of 35.2 feet, which was within 2 feet of the highest stage of record and exactly equal to the crest stage of the December 1932, flood. However, because of the fact that this recent flood was in spring rather than in winter, the losses were considerably greater. Timely warnings were issued for these floods. Reports from the various interested people and organizations after the subsidence of the floods indicate that the warnings were more generally heeded than ordinarily, and resulted in an unusually large saving of property and livestock. Lumber companies, especially, made good use of the warnings, and moved large amounts of logs and lumber to higher ground, in addition to moving equipment out of the swamps and lowlands.

High water occurred in the upper Mississippi River, but flood stage was not reached at any gage station. However, apprehension was felt because of the dams under construction there. When the Weather Bureau advised that high water would occur, the cofferdams were reinforced, and no damage was caused to any of the construction projects on the locks and dams.

A very high flood occurred in the Meramec River in Missouri. Notwithstanding the unusually high water, flood losses were not very large. The flood, coming early in the spring, caused much less damage to crops than it would have caused a month or two later.

An ice gorge formed in the Missouri River about 5 miles below Sioux City, Iowa, on the night of the 6-7th.

The gorge caused some apprehension, but as the river was low only slight damage resulted.

The flood in the Ohio River was not of serious proportions, and the damage was comparatively small.

In Arkansas and southern Missouri, there were severe floods in the White and St. Francis River systems. At Poplar Bluff, Mo., on the Black River, Georgetown, Ark., on the White River, and Fisk, Mo., and St. Francis, Ark., on the St. Francis River, the flood waters reached higher stages than ever previously recorded.

Several breaks occurred in the St. Francis River levees. In all, 62 breaks occurred, varying in width from 40 to 400 feet. It is estimated that 175,000 acres of land were flooded by the St. Francis flood; the flooded area was situated in Butler, Stoddard and Dunklin Counties of Missouri, and Clay, Greene, Craighead, and Mississippi Counties of Arkansas. Many farmers fled, abandoning household goods, livestock, etc. Four companies of the Missouri National Guard were called out and sent to the flooded area to preserve order and assist the flood-stricken people. The Red Cross assisted 25,000 flood refugees. Four persons were drowned.

Comments on the floods in the Yazoo and Tallahatchie Rivers in Mississippi, and in the Lower Mississippi River and Green River in Kentucky, will be made in a later issue of the MONTHLY WEATHER REVIEW.

Besides the floods in the streams where flood service is maintained, there were severe local floods in small streams as follows:

In the upper Tug Valley of West Virginia there was an unprecedented flood. The railroad between Bluefield and Welch was out of service for over 2 weeks, and much damage was done to highways.

At Sebawaing, Mich., on the Sebawaing River, there was an ice gorge that caused flooding with much damage to property.

The melting of the heavy snow cover in the northern portion of Wisconsin caused rapidly rising waters in all the small streams of that state from the 22d to 25th. Attendant ice gorges caused many overflows, with considerable damage to highways.